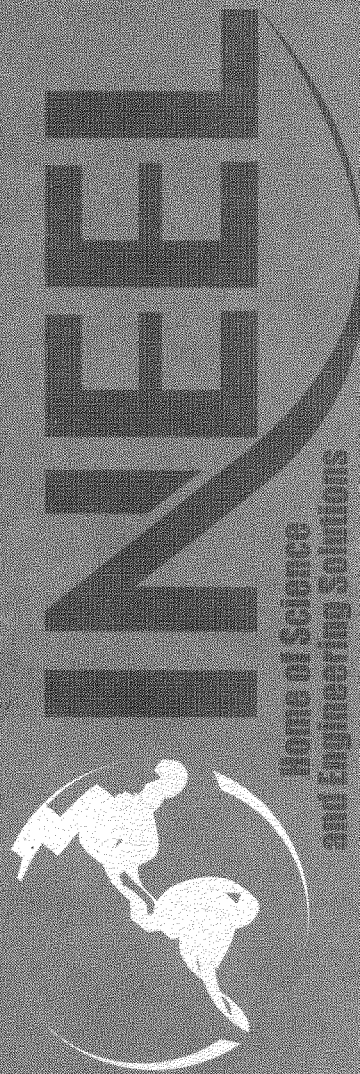


TFR-157

System Design Criteria for the OU 7-10 Glovebox Excavator Method Project

Fire Protection Design Criteria

October 2002



*Idaho National Engineering and Environmental Laboratory
Bechtel BWXT Idaho, LLC*

TFR-157
Revision 2
October 11, 2002

**System Design Criteria
for the OU 7-10
Glovebox Excavator Method Project

Fire Protection Design Criteria**

October 2002

**Idaho National Engineering and Environmental Laboratory
Environmental Restoration Program
Idaho Falls, Idaho 83415**

**Prepared for the
U.S. Department of Energy
Assistant Secretary for Environmental Management
Under DOE Idaho Operations Office
Contract DE-AC07-99ID13727**

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ACRONYMS

CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
FHA	fire hazards analysis
FM	Factory Mutual
IBC	International Building Code
IFC	International Fire Code
INEEL	Idaho National Engineering and Environmental Laboratory
NFPA	National Fire Protection Association
OU	operable unit
PGS	Packaging Glovebox System
RCS	Retrieval Confinement Structure
RWMC	Radioactive Waste Management Complex
SDA	Subsurface Disposal Area
SDC	system design criteria
TFR	technical and functional requirement
WES	Weather Enclosure Structure

System Design Criteria for the OU 7-10 Glovebox Excavator Method Project

Fire Protection Design Criteria

1. INTRODUCTION

This system design criteria (SDC) document establishes the fire protection criteria for the Operable Unit (OU) 7-10 Glovebox Excavator Method Project. It is intended to augment the parent document (i.e., *Technical and Functional Requirements for the Operable Unit 7-10 Glovebox Excavator Method Project* [INEEL 2002a]) sufficiently to enable performance of the OU 7-10 Glovebox Excavator Method Project detailed design, engineering, and evaluation activities.

The *Record of Decision: Declaration of Pit 9 at the Radioactive Waste Management Complex Subsurface Disposal Area at the Idaho National Engineering Laboratory, Idaho Falls, Idaho* (DOE-ID 1993) specifies the environmental remediation of transuranic waste from OU 7-10 (which comprises Pit 9) of Waste Area Group 7. On October 1, 2001, the Idaho National Engineering and Environmental Laboratory (INEEL) published the *Waste Area Group 7 Analysis of OU 7-10 Stage II Modifications* (INEEL 2001), which identified a feasible approach for retrieving waste from OU 7-10. The project was established to accomplish the objectives presented in that report. The overall objectives for the project are as follows:

- Demonstrate waste zone material retrieval
- Provide information on any contaminants of concern present in the underburden
- Characterize waste zone material for safe and compliant storage
- Package and store waste onsite, pending decision on final disposition.

This project was requested by the U.S. Department of Energy Idaho Operations Office (DOE-ID) in support of the *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991), OU 7-10 Record of Decision (DOE-ID 1993), *Explanation of Significant Differences for the Pit 9 Interim Action Record of Decision at the Radioactive Waste Management Complex Subsurface Disposal Area at the Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho* (DOE-ID 1998), and Appendix A of *Remedial Design/Remedial Action Scope of Work and Remedial Design Work Plan: OU 7-10 (Pit 9 Project Interim Action)* (LMITCO 1997).

1.1 Facility Description

The INEEL is a U.S. Department of Energy (DOE) facility, located 52 km (32 mi) west of Idaho Falls, Idaho, and occupies 2,305 km² (890 mi²) of the northeastern portion of the Eastern Snake River Plain. The Radioactive Waste Management Complex (RWMC) is located in the southwestern portion of the INEEL. The Subsurface Disposal Area (SDA) is a 39-ha (97-acre) area located in the RWMC. Waste Area Group 7 is the designation recognized by the “Comprehensive Environmental Response, Compensation, and Liability Act of 1980” (42 USC § 9601 et seq.) and in the *Federal Facility Agreement and Consent Order for the Idaho National Engineering and Environmental Laboratory* (DOE-ID 1991) for the RWMC, which comprises the SDA buried waste site. Waste Area Group 7 has been divided into

13 OUs^a. Pit 9, designated OU 7-10, is located in the northeast corner of the SDA. The OU 7-10 site is an area into which chemicals, radioactive materials, and sludge from DOE weapons plants and other government programs were disposed. While such disposal at the RWMC began in 1952, OU 7-10 was used and filled in the late 1960s. The pit contains characteristic hazardous, listed hazardous, low-level radioactive, and transuranic waste.

The project facilities and processes are being designed to safely conduct a waste zone material retrieval demonstration in a selected area of Pit 9. The project processes consist of excavation and retrieval; sampling, packaging, and interim storage; shutdown, deactivation, decontamination, and decommissioning; and environmental monitoring. Project facilities include a Weather Enclosure Structure (WES), Retrieval Confinement Structure (RCS), excavator, ventilation system, and other supporting equipment. The packaged material will be stored onsite, pending decision on final disposition.

1.2 Limitations of the System Design Criteria

This SDC document defines the criteria for the fire protection aspects of the project. The SDC flow directly from the Technical and Functional Requirement (TFR) document (INEEL 2002a) and are intended to include detail not provided in the TFRs, client requirements, and those codes, standards, and regulations that will be used as a basis for designing the fire protection systems. Design criteria will be revised, as needed, as the project proceeds.

This SDC document focuses only on the fire protection design criteria. System design criteria for general structures and site, process, excavation, packaging, facility and infrastructure, and instrumentation and control are addressed in separate documents.

1.3 Ownership of the System Design Criteria

These system design criteria are the product of the combined activities of the project team. The project engineer has the ultimate responsibility for the content and approval of this document.

a. Operable Units 13 and 14 were combined in the comprehensive remedial investigation and feasibility study in 1995 (Huntley and Burns 1995).

2. OVERVIEW

2.1 Facility, Structure, System, Component Functions

The project facility fire protection system will consist of the following subsystems:

- Water supply
- Fire extinguishers
- The WES automatic sprinkler system
- The RCS automatic sprinkler system
- The RCS manual deluge system
- Packaging Glovebox System (PGS) automatic extinguishing system
- Project fire detection and alarm system.

2.2 Facility, Structure, System, and Component Classification

No safety-class structures, systems, and components are associated with the OU 7-10 Glovebox Excavator Method Project.

The “Preliminary Documented Safety Analysis for the Operable Unit 7-10 Glovebox Excavator Method Project (Draft)” (INEEL 2002b) describes the facility safety basis and identifies its safety-significant design features. It prescribes minimum design criteria and functional requirements for the Glovebox Excavator Method Project to follow. The Preliminary Documented Safety Analysis identifies no safety-significant or low safety consequence structures, systems, and components for the fire protection system.

2.3 Operational Overview

This project includes systems to support the retrieval and packaging of waste zone materials. The site where the facilities will be located has 6-in. diameter probes that were installed to refusal during Stage I of the OU 7-10 Staged Interim Action Project. These probes may be removed during waste zone material retrieval to facilitate retrieval and underburden sampling operations. Overburden will be excavated and packaged before disturbing waste zone material.

A manned excavator will retrieve waste zone material. The operator will be located in the WES outside the RCS. The excavator arm, located within the RCS, will excavate an angular swath. The retrieved material in the excavator bucket will then be placed into a transfer cart. One transfer cart will be located at the entrance of each of the three material packaging gloveboxes. The carts will transport waste zone material into the gloveboxes, where it will be inspected, sampled, and packaged. Packaged waste will then be assayed to determine total fissile mass. The waste will then be stored onsite, pending decision on final disposition.

After waste zone material excavation is complete and samples of the underburden are taken, the pit will be backfilled for closure before deactivation, decontamination, and decommissioning.

Operational overviews for the six fire protection subsystems are discussed in the following paragraphs.

2.3.1 Water Supply

The RWMC will provide adequate firewater to supply the facility fire suppression systems and provide a way for the INEEL Fire Department to conduct manual suppression fire-ground operations. The minimum acceptable supply is 2,000 gpm at 20 psi.

Connections to the RWMC firewater system will be sized to provide required flows and pressures for the most demanding automatic suppression system. The Fire Riser Building for the OU 7-10 Glovebox Excavator Method Project facility will be located so that it does not require extension of underground firewater piping to the SDA.

A minimum of one fire hydrant, accessible by fire department apparatus, will be located within 300 ft of the facility. Supply piping to the hydrant will be sized to provide a minimum of 2,000 gpm at 20-psi fire flow. Because of the temporary nature of the facility, and the soil disturbance restrictions in the SDA, above groundwater supply piping will be provided for the fire hydrant. The design will incorporate sound engineering practice with compliance to relevant codes and standards. The hydrant water supply piping will provide a hard connection to the RWMC firewater distribution system. The piping and hydrant will be maintained normally dry and provide for drainage to prevent freeze damage. A PGS water tank and dust suppression water tank fill line will be provided from the Fire Riser Building to the WES. This line will also consider drain points and line freezing.

2.3.2 Weather Enclosure Structure Automatic Sprinkler System

A dry-pipe automatic sprinkler system will be provided throughout all areas of the WES. The system will provide protection for an Ordinary Hazard, Group 2 occupancy. The system will be based on a minimum density of 0.2 gpm/ft² over the most hydraulically remote 1,950 ft² or the area of the WES, whichever is smaller. A 500-gpm-hydrant allowance will be added at the point of connection to the main firewater distribution system. The available water supply for design purposes will be considered 150 psi static, 145 psi residual, flowing 950 gpm, based on July 1998 testing data.

An air supply will be provided to maintain required air pressure on the system and to refill the system piping within 30 minutes.

The sprinkler system piping will be routed from the Fire Riser Building, located in the RWMC Operations Area, to the WES, using a pipe rack support system to prevent physical damage to the system. Piping will be sloped to drain; all low points will incorporate auxiliary drains and will be equipped with drain valves.

2.3.3 Retrieval Confinement Structure Automatic Sprinkler System

A dry-pipe automatic sprinkler system will be provided throughout all areas of the RCS, including associated air locks.

The system will provide protection for an Ordinary Hazard, Group 2 occupancy. The system will be based on a minimum density of 0.2 gpm/ft² over the most hydraulically remote 1,950 ft² or the area of the RCS—whichever is smaller. A 500-gpm outside hydrant allowance will be added at the point of connection to the main firewater distribution system. The available water supply for design purposes will

be considered 150 psi static, 145 psi residual, flowing 950 gpm, based on July 1998 testing data. Sprinklers for the system will be upright, high temperature sprinklers.

An air supply will be provided to maintain required air pressure on the system and to refill the piping within 30 minutes.

The sprinkler system piping will be routed from the Fire Riser Building, located in the RWMC Operations Area, to the RCS using a pipe rack. Piping will be sloped to drain, and low points will be minimized to the extent practical. Low points, or similar water traps, in the piping will be provided with readily accessible auxiliary drains. The low-point drains will neither discharge within the RCS nor will personnel in the RCS be required to drain the system.

2.3.4 Retrieval Confinement Structure Manual Deluge System

A manual deluge nozzle system will provide suppression capabilities in the unlikely event of high-challenge, smoldering fires involving waste within the excavation area.

The manual nozzle system will be activated manually and will include two spray nozzles, designed for 250 gpm per nozzle. The manual monitor nozzle system will be engineered and installed to provide a fixed nozzle direction and spray pattern so that when both nozzles are engaged, the entire excavation area can be sprayed in the event of large, smoldering fires. Layout will preclude the risk of high-pressure water streams striking and damaging the inside of the RCS. A 500-gpm outside hydrant allowance will be added at the point of connection to the main firewater distribution system. The available water supply for design purposes will be considered 150 psi static, 145 psi residual, flowing 950 gpm, based on July 1998 testing data.

The supply piping for the system will be routed from the sprinkler riser enclosure, located in the RWMC Operations Area, to the RCS using a pipe rack to prevent physical damage. Piping will be sloped to the riser, and low points will be minimized. Low points, within the system, will be provided with readily accessible auxiliary drains. The auxiliary drains will not discharge within the RCS.

2.3.5 Packaging Glovebox System Automatic Extinguisher System

Each glovebox in the PGS will be provided with a water-based fire extinguishing system designed to respond to and control design-basis fires within the glovebox(es) and minimize the associated facility damage, spread of contamination, and program interruption. The system will be designed to minimize the fire exposure on the glovebox structure and thus reduce the potential for structural failure of the glovebox walls and ceiling. It is assumed that the PGS ventilation system will be capable of maintaining required face velocities across all gloveports within a single glovebox should they be compromised during the early stages of a fire.

The extinguishing systems will be water mist and provide fire suppression for each of the gloveboxes, using three zones. (Each zone encompasses one of the three gloveboxes that comprise the PGS.) The system will have a self-contained water supply. Quick-response, ordinary temperature automatic nozzles will provide system activation.

The PGS fire extinguishing system will be listed or approved for hazards characterized as Ordinary Hazard Group 1.

Each PGS extinguishing zone will include an additional open-head nozzle that can be activated manually to optimize operator intervention of incipient fires and further reduce the potential for fires that would compromise gloves.

2.3.6 Fire Detection and Alarm System

The project facility will be provided with a fire alarm system. The system will transmit annunciation of fire alarm, supervisory, and trouble conditions to the INEEL Proprietary Fire Alarm Monitoring System using the Digital Alarm Communication Transmitter/Digital Alarm Communication Receiver monitoring equipment.

The system will include the control panel, backup power supply, manual fire alarm stations at each personnel exit door, water flow alarms for automatic suppression systems, occupant notification audible and visual signals, and monitoring for the installed fire protection systems (wet and dry sprinkler systems; water-mist fire extinguishing system). The system will report alarm, trouble, and supervisory alarm conditions to the INEEL Fire Alarm Center. The fire alarm control panel will be located in the WES, near the water-mist fire protection system. Carbon monoxide generated from deep-seated smoldering fires will be detected by an ion monitoring system to be provided in the RCS.

2.3.7 Onsite Assay and Waste Storage

Assay and similar waste examination trailers will not be provided with automatic fire protection equipment. Rather, such units will be sited in a manner that minimizes fire exposure to or from adjacent structures and wildlands.

Onsite waste storage may be provided through the utilization of an existing RWMC Type II storage module or portable hazardous material storage units. Storage of waste containers will be in accordance with the authorization basis requirements for the RWMC Type II storage modules and will, therefore, not require additional fire protection design measures for this project. If portable hazardous material storage units are utilized, design and operations will provide separation that minimizes fire exposure to or from adjacent structures and wildlands. Combustible loading will be restricted to the extent that potential fire exposures will not affect waste storage drum integrity. The design will not provide for automatic fire protection equipment within portable hazardous material storage units.

3. DESIGN CRITERIA AND BASES

The project facility will be provided with fire protection systems, as required by DOE Order 420.1, “Facility Safety.” This order mandates compliance with the International Building Code (IBC) and the National Fire Protection Association (NFPA) codes and standards. The NFPA 801, “Standard for Fire Protection for Facilities Handling Radioactive Materials,” is applicable to the OU 7-10 Glovebox Excavator Method Project and the source for fundamental design criteria, including fire protection systems. The NFPA 801, 4-1.1 stipulates that a fire hazards analysis (FHA) be conducted to determine the fire protection requirements for the facility. The *Fire Hazards Analysis for the OU 7-10 Glovebox Excavator Method* (Gosswiller 2002) has been completed and is the basis for requirements stated herein. The FHA shall be updated, as necessary, through the design process. Final approval of the FHA is based on approved-for-construction design documentation. It will be required to validate the adequacy of designed systems.

3.1 General Fire Protection Systems

3.1.1 Operational Design Criteria

Operational design criteria for the fire protection systems are addressed specifically for each of the identified subsystems in the following subsections.

3.1.2 Accident Design Criteria

Accident design criteria for the fire protection systems are addressed specifically for each of the identified subsystems in the following subsections.

3.1.3 Safety-Significant Items

Safety-significant items for the fire protection systems are addressed specifically for each of the identified subsystems in the subsections that follow.

3.1.4 Applicable Regulatory and Contractual Requirements

The following regulatory and contractual requirements are applicable to all fire protection systems in addition to those that are listed specifically in the subsections:

- 29 CFR 1910, “Occupational Safety and Health Regulations” (2002)
- 29 CFR 1926, “Safety and Health Regulations for Construction” (2002)
- DOE O 420.1, “Facility Safety” (2002)
- DOE-ID “Architectural Engineering Standards” (Revision 27).

3.1.5 Applicable Industry Codes and Standards

The following industry codes and standards are applicable to all fire protection systems in addition to those that are listed specifically in the subsections:

- NFPA 801, “Standard for Fire Protection for Facilities Handling Radioactive Material” (1998)

- NFPA 10, “Standard for Portable Fire Extinguishers” (1998)
- NFPA 13, “Standard for the Installation of Automatic Sprinkler Systems” (1999)
- NFPA 20, “Standard for the Installation of Stationary Pumps for Fire Protection” (1999)
- NFPA 70, “National Electric Code” (2001)
- NFPA 72, “National Fire Alarm Code” (1999)
- NFPA 101, “Life Safety Code” (2000)
- NFPA 750, “Installation of Water Mist Systems” (2000)
- IBC-2000, “2000 International Building Code” (2000)
- IFC-2000, “2000 International Fire Code” (2000).

3.2 Facility Water Supply

The project facility shall provide adequate firewater to supply facility fire suppression systems and provide a means for the INEEL Fire Department to conduct manual suppression fire operations.

3.2.1 Operational Design Criteria

The following operational design criteria are specific to the project facility water supply:

1. The RWMC firewater distribution and water storage system shall be the source of firewater for the OU 7-10 Glovebox Excavator Method Project facility.

 Basis: Per DOE O 420.1, “Facility Safety,” the fire protection system must be fed by a reliable water supply of adequate capacity for fire suppression. The RWMC firewater distribution system is the closest supply meeting this criterion. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.
2. Connections to the firewater distribution system shall be sized to provide required flows and pressures for the most demanding fire suppression system.

 Basis: Per DOE O 420.1, “Facility Safety,” the suppression system must be sized to provide required flows and pressures. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.
3. The Fire Riser Building for the OU 7-10 Glovebox Excavator Method Project facility shall be located in such a manner that it does not require extension of the underground fire water piping into the SDA.

 Basis: Because of the excavation restrictions resulting from the buried waste at the SDA, extension of underground firewater piping to the SDA is not feasible. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.
4. Manual isolation of the OU 7-10 Glovebox Excavator Method Project fire suppression supply risers shall be provided at the Fire Riser Building.

Basis: As required by NFPA 13. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

5. A minimum of one fire hydrant, accessible by fire department apparatus, shall be located within 300 ft of the facility.

Basis: Per DOE O 420.1, "Facility Safety," a reliable water supply of adequate capacity for fire suppression must be provided. The 300-ft Fire Marshal requirement is based on the requirements of the International Fire Code (IFC). TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

6. Supply piping to the fire hydrant shall be sized to provide a minimum of 2,000 gpm at 20-psi fire flow.

Basis: Per DOE O 420.1, "Facility Safety," the fire suppression system must be sized to provide required flows and pressures. Fire Marshal minimum flow and pressure requirements are based on the requirements of the IFC. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

7. Because of the temporary nature of the OU 7-10 Glovebox Excavator Method Project facility and soil disturbance restrictions in the SDA, the fire hydrant and supply piping assembly shall be temporary. The design shall incorporate sound engineering practice with compliance to the cited codes and standards to the maximum extent feasible.

Basis: Because of the excavation restrictions resulting from the buried waste at the SDA, extension of underground firewater piping into the SDA is not feasible. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

8. The supply piping shall provide for a hard connection to the RWMC firewater distribution system.

Basis: Per DOE O 420.1, "Facility Safety," a reliable water supply of adequate capacity for fire suppression must be provided. Hard connection to the RWMC system ensures reliability. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

9. The piping from the riser building to the fire hydrant normally shall be maintained dry and provide for adequate drainage to prevent freeze damage.

Basis: Because of the excavation restrictions resulting from the buried waste at the SDA, extension of underground firewater piping into the SDA is not feasible. As such, appropriate freeze protection must be implemented. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

3.2.2 Accident Design Criteria

The following accident design criteria are specific to the project facility water supply:

1. The hydrant and associated piping shall be located or protected to prevent vehicular collision damage.

Basis: Per DOE O 420.1, "Facility Safety," a reliable water supply of adequate capacity for fire suppression must be provided. Protection from collision ensures reliability and is a requirement of NFPA 13. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

3.2.3 Safety-Significant Items

Not applicable.

3.2.4 Applicable Regulatory and Contractual Requirements

Only the applicable regulatory and contractual requirements identified in Section 3.1.4 apply to this system.

3.2.5 Applicable Industry Codes and Standards

Only the applicable industry codes and standards identified in Section 3.1.5 apply to this system.

3.3 Fire Extinguishers

3.3.1 Operational Design Criteria

The following operational design criteria are specific to the project fire extinguishers:

1. The project structures and storage areas shall be provided with fire extinguishers that are adequate to combat incipient-stage fires involving Class A, B, or C materials.

Basis: Portable fire extinguishers are imposed by 29 CFR 1910, "Occupational Safety and Health Standards," Subpart L, "Fire Protection." Proper selection of extinguishers is guided by NFPA 10, "Standard for Portable Fire Extinguishers," 1998 edition. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

3.3.2 Accident Design Criteria

No accident design criteria have been identified for the project fire extinguishers.

3.3.3 Safety-Significant Items

Not applicable.

3.3.4 Applicable Regulatory and Contractual Requirements

Only the applicable regulatory and contractual requirements identified in Section 3.1.4 apply to this system.

3.3.5 Applicable Industry Codes and Standards

Only the applicable industry codes and standards identified in Section 3.1.5 apply to this system.

3.4 Weather Enclosure Structure and Retrieval Confinement Structure Automatic Sprinkler Systems

3.4.1 Operational Design Criteria

The following operational design criteria are specific to the WES and RCS automatic sprinkler systems:

1. A dry-pipe automatic sprinkler system shall be provided throughout all areas of the WES and RCS in accordance with NFPA 13. This includes the spaces beneath the PGS gloveboxes and any other fixed, horizontal obstructions greater than 48 in. wide.

Basis: In accordance with DOE O 420.1, automatic fire sprinkler systems must be provided throughout all significant facilities and in all areas subject to loss of safety class systems, significant life safety hazards, unacceptable program interruptions, or fire loss potential in excess of defined limits. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

2. The automatic sprinkler system shall provide protection for an Ordinary Hazard, Group 2 occupancy.

Basis: The design criteria are in accordance with the requirements identified in the *Fire Hazards Analysis for the OU 7-10 Glovebox Excavator Method*. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

3. The automatic sprinkler systems shall be based upon a minimum density of 0.2 gpm/ft² over the most hydraulically remote 1,950 ft² or the area of the WES or RCS, respectively, whichever is smaller.

Basis: Per DOE O 420.1, "Facility Safety," the suppression system must be sized to provide the required pressures and flows. Determination of minimum flows and pressures is in accordance with NFPA 13 and the DOE-ID *Architectural Engineering Standards* as documented in the *Fire Hazards Analysis for the OU 7-10 Glovebox Excavator Method*. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

4. An additional 500-gpm outside hose stream allowance shall be added at the point of connection to the main firewater distribution system.

Basis: Per DOE O 420.1, "Facility Safety," the suppression system must be sized to provide the required pressures and flows. Determination of minimum flows and pressures is in accordance with NFPA 13 and the DOE-ID *Architectural Engineering Standards* as documented in the *Fire Hazards Analysis for the OU 7-10 Glovebox Excavator Method*. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

5. The available water supply for design purposes shall be considered 150 psi static, 145 psi residual, flowing 950 gpm based on July 1998 testing data. Alternately, additional flow tests may be conducted to identify available water supply.

Basis: Per DOE O 420.1, "Facility Safety," the suppression system must be sized to provide the required pressures and flows. For design purposes, water supply tests are required by NFPA 13 to identify available water supply. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

6. Sprinklers for the automatic sprinkler systems are to be upright and ordinary-temperature. Intermediate or high temperature sprinkler heads will be used as required by NFPA 13 in the vicinity of radiant heaters.

Basis: In accordance with NFPA 13. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

7. A dedicated air supply shall be provided to maintain minimum required air pressures on the WES and RCS automatic dry sprinkler systems.

Basis: To ensure proper operation of the WES and RCS automatic dry sprinkler system. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

8. The supply piping for the automatic sprinkler systems shall be routed from the sprinkler enclosure (located in the RWMC Operations Area) to the WES and RCS, respectively, in a manner that prevents physical damage.

Basis: Per DOE O 420.1, "Facility Safety," a reliable water supply of adequate capacity for fire suppression must be provided. Protection from physical damage to the system ensures reliability. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

9. Piping shall be sloped to drain. Low points in the piping shall be minimized.

Basis: Appropriate freeze protection must be implemented.

10. Low points in the piping shall be provided with readily accessible auxiliary drains.

Basis: Appropriate freeze protection must be implemented.

11. The low point drains will neither discharge in the RCS nor will personnel within the RCS be required to drain the system.

Basis: Appropriate freeze protection must be implemented.

12. Fire sprinkler heads shall protect the exterior side of the excavator confinement window.

Basis: The *Fire Hazards Analysis for the OU 7-10 Glovebox Excavator Method* (Gosswiller 2002) identified a window water curtain as a requirement to protect the window and associated confinement from exposing fires involving the excavator. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

3.4.2 Accident Design Criteria

The following accident design criteria are specific to the WES automatic sprinkler system:

1. The WES automatic sprinkler system shall be protected against damage from earthquakes using earthquake sway bracing based upon Factory Mutual (FM) Data Sheet 2-8 using a "G" factor of 0.5.

Basis: System is required to be operational when the WES is operational. Seismic protection requirements are in accordance with FM recommendations for improved risk property. TFR Sections 3.2.5-1, 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

3.4.3 Safety-Significant Items

Not applicable.

3.4.4 Applicable Regulatory and Contractual Requirements

Only the applicable regulatory and contractual requirements identified in Section 3.1.4 apply to this system.

3.4.5 Applicable Industry Codes and Standards

In addition to the industry codes and standards applicable to general fire protection systems, the following industry codes and standards are specific to the WES automatic sprinkler system:

- NFPA 13, “Standard for the Installation of Automatic Sprinkler Systems” (1999)
- Factory Mutual Data Sheet 2-8, *Earthquake Protection for Sprinkler Systems*.

3.5 Retrieval Confinement Structure Manual Deluge Nozzle System

A manual deluge nozzle system will be designed to provide fire suppression capabilities in the unlikely event that high-challenge, smoldering fires involving waste within the excavation area occur.

3.5.1 Operational Design Criteria

The following operational design criteria are specific to the RCS manual deluge nozzle system:

1. The RCS manual deluge nozzle system shall include two spray nozzles and be engineered and installed to provide a fixed nozzle direction and spray pattern. In the event of a large smoldering fire, both nozzles will be engaged and the entire excavation area will be sprayed. Each nozzle will deliver a nominal 250 gpm.

Basis: Per DOE O 420.1, “Facility Safety,” the suppression system must be sized to provide the required flows and pressures. Minimum flow and pressure requirements are established in the *Fire Hazards Analysis for the OU 7-10 Glovebox Excavator Method*. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

2. An allowance of 500 gpm for outside hose stream will be added at the facility water pipe point of connection to the RWMC firewater distribution system.

Basis: Per DOE O 420.1, “Facility Safety,” the suppression system must be sized to provide the required flows and pressures. Determination of minimum flows and pressures is in accordance with NFPA 13 and the DOE-ID *Architectural Engineering Standards* as documented in the *Fire Hazards Analysis for the OU 7-10 Glovebox Excavator Method*. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

3. The available water supply for design purposes shall be considered 150 psi static, 145 psi residual, flowing 950 gpm based on July 1998 testing data. Alternately, additional flow tests may be conducted to identify available water supply.

Basis: Per DOE O 420.1, "Facility Safety," the suppression system must be sized to provide the required pressures and flows. Water supply tests are required by NFPA 13 to identify available water supply for design purposes. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

4. The supply piping for the system shall be routed from the sprinkler building, located in the RWMC Operations Area, to the RCS in a manner that prevents physical damage to the system.

Basis: Per DOE O 420.1, "Facility Safety," a reliable water supply of adequate capacity for fire suppression must be provided. Protection from physical damage to the system ensures reliability. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

5. The RCS manual deluge nozzle system shall not damage the RCS.

Basis: Ensure confinement of radioactive and hazardous constituents, as well as minimize programmatic interruptions resulting from damage caused by the RCS manual deluge nozzle system. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

6. Piping shall be sloped to drain. Low points in the piping shall be minimized.

Basis: Appropriate freeze protection must be implemented.

7. Low points in the piping shall be provided with readily accessible auxiliary drains.

Basis: Appropriate freeze protection must be implemented.

3.5.2 Accident Design Criteria

The following accident design criteria are specific to the RCS manual deluge system:

1. The deluge nozzle system will be protected against damage from earthquakes using earthquake sway bracing based upon FM Data Sheet 2-8 using a "G" factor of 0.5.

Basis: System is required to be operational when the WES is operational. Seismic protection requirements are in accordance with FM recommendations for improved risk property. TFR Section 3.2.5-1, 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

2. The manual activation system will be designed such that a single isolation valve failure will not produce water flow to the RCS.

Basis: Minimize potential for programmatic interruption as a result of inadvertent water flow into the pit. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

3.5.3 Safety-Significant Items

Not applicable.

3.5.4 Applicable Regulatory and Contractual Requirements

Only the applicable regulatory and contractual requirements identified in Section 3.1.4 apply to this system.

3.5.5 Applicable Industry Codes and Standards

In addition to the industry codes and standards applicable to general fire protection systems, the following industry codes and standards are specific to the RCS manual deluge system:

- NFPA 15, “Standard for Water Spray Fixed Systems for Fire Protection” (2001)
- Factory Mutual Data Sheet 2-8, *Earthquake Protection for Sprinkler Systems*.

3.6 Packaging Glovebox System Automatic Extinguishing System

Each glovebox in the PGS shall be provided with a water mist extinguishing system designed to respond to and control design-basis fires within the glovebox. The system will be designed to minimize the fire exposure on the glovebox structures and thus reduce the potential for structural failure of the glovebox walls and ceiling. It is assumed that the PGS ventilation system will be capable of maintaining required face velocities across all gloveports within a single glovebox should they be compromised during the early stages of a fire.

A Grinnel AquaMist OH-2 water mist system consisting of Type AM24 nozzles, a water tank with a capacity adequate for 30 minutes of design flow from each automatic nozzle within a single glovebox, and diesel fire pump sized to provide required flows and pressures will be provided and consist of three separate zones (each of three gloveboxes that comprises the PGS).

3.6.1 Operational Design Criteria

The following operational design criteria are specific to the PGS automatic extinguishing system:

1. The PGS extinguishing systems shall be designed to effectively suppress and control fires involving Class A and B combustible materials. Specifically, the system shall be UL listed or FM approved for hazards characterized as Ordinary Hazard Group 1.

Basis: As established in the *Fire Hazards Analysis for the OU 7-10 Glovebox Excavator Method*. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

2. The system will use quick response, ordinary temperature, and automatic nozzles installed in accordance with their listing requirements.

Basis: To ensure rapid, automatic activation. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

3. The system shall provide for a single open-head nozzle at each of the gloveboxes that can be activated manually.

Basis: Best management practice to maximize operator intervention during incipient stage of fire to minimize size and duration of fire and reduce potential for glove failure. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

4. The extinguishing system and associated water supply shall be reliable within the environmental conditions presented by the PGS/WES.

Basis: System components must meet functional design requirements under all anticipated operating conditions. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

5. The extinguishing system shall include a water supply that is independent of the RWMC firewater distribution system.

Basis: Safety-significant classification of system will not extend to the RWMC firewater storage and distribution system if a stand-alone water supply is provided. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

6. The extinguishing system shall include a UL listed or FM approved diesel fire pump capable of providing required flows and pressures.

Basis: As required by the listing of the nozzles. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

3.6.2 Accident Design Criteria

The following accident design criteria apply to the PGS Automatic Extinguishing System:

1. The PGS Automatic Extinguishing System shall be protected against damage from earthquakes using earthquake sway bracing based upon FM Data Sheet 2-8 using a “G” factor of 0.5.

Basis: As required by NFPA 750. TFR Sections 3.2.5-1, 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

3.6.3 Safety-Significant Items

Not applicable.

3.6.4 Applicable Regulatory and Contractual Requirements

Only the applicable regulatory and contractual requirements identified in Section 3.1.4 apply to this system.

3.6.5 Applicable Industry Codes and Standards

Only the applicable industry codes and standards identified in Section 3.1.5 apply to this system.

3.7 Fire Detection and Alarm System

The project facility shall be provided with a fire detection and annunciation of fire alarm, supervisory, and trouble conditions. The RCS shall be provided with a carbon monoxide alarm system to monitor for carbon monoxide generated from deep-seated, smoldering fires.

3.7.1 Operational Design Criteria

The following operational design criteria are specific to the fire detection and alarm system:

1. The fire detection and alarm system shall provide for manual fire alarm stations, as required.

Basis: 29 CFR 1910, “Occupational Safety and Health Standards,” Subpart L, “Fire Protection,” mandates the inclusion of manual fire alarm stations. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

2. The fire detection and alarm system shall provide occupant notification appliances in the WES to notify occupants upon activation of fire initiation devices, including those associated with the PGS extinguishing system.

Basis: Per DOE O 420.1, "Facility Safety," and 29 CFR 1910, "Occupational Safety and Health Standards," Subpart L, "Fire Protection," mandates occupant notification appliances. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.
3. The fire detection and alarm system shall report alarm, trouble, and supervisory alarm conditions to the INEEL Fire Alarm Center.

Basis: NFPA 72 minimum requirement for proprietary alarm systems. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.
4. The RCS shall be monitored for carbon monoxide. The detection system shall provide for a distinct local alarm and report to the INEEL Fire Alarm Center as a supervisory alarm. The system shall be capable of multiple alarm settings with a low-level alarm set point of 50 ppm and a high-level alarm set point of 100 ppm.

Basis: As required by the *Fire Hazards Analysis for the OU 7-10 Glovebox Excavator Method Project*. Carbon monoxide detection provides for early notification of deep-seated fires so that manual suppression tactics can be initiated to prevent the potential for underground spread of fire through the waste zone. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

3.7.2 Accident Design Criteria

The following accident design criteria are specific to the fire detection and alarm system:

1. The system shall be capable of normal operation under normal electrical power loss for a minimum of 24 hours.

Basis: NFPA 72 requirement.
2. The fire detection and alarm systems shall remain functional following a PC-2 design basis earthquake.

Basis: As identified in the General Structures and Site System Design Criteria. System is required to be operational when the WES is operational. Seismic protection requirements are in accordance with FM recommendations for improved risk property.

3.7.3 Safety-Significant Items

Not applicable.

3.7.4 Applicable Regulatory and Contractual Requirements

Only the applicable regulatory and contractual requirements identified in Section 3.1.4 apply to this system.

3.7.5 Applicable Industry Codes and Standards

Only the applicable industry codes and standards identified in Section 3.1.5 apply to this system.

3.8 Waste Examination/Storage

This section includes the fire protection requirements for the waste examination and storage areas.

3.8.1 Operational Design Criteria

The following operational design criteria are specific to the project waste examination trailers and storage facilities:

1. The assay trailer and other waste examination trailers shall be located a minimum of 20 ft from adjacent project structures and storage areas.

Basis: International Building Code, Table 602. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3 and 3.3.7-4.
2. The assay trailer and other waste examination trailers will be provided with a minimum defensible space of 30 ft.

Basis: GDE-7063, "INEEL Wildland Fire Management Guide." TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.
3. If portable hazardous material storage units are utilized for onsite storage, they shall be of noncombustible construction.

Basis: NFPA 801, "Standard for Fire Protection for Facilities Handling Radioactive Materials." TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3 and 3.3.7-4.
4. If portable hazardous material storage units are utilized for onsite storage, they shall be located a minimum of 20 ft from adjacent project structures (excluding adjacent storage units).

Basis: International Building Code, Table 602. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3 and 3.3.7-4.
5. If portable hazardous material storage units are utilized for onsite storage, they shall be provided with a minimum defensible space of 30 ft.

Basis: GDE-7063, "INEEL Wildland Fire Management Guide." TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.
6. Waste containers stored in portable hazardous material storage units will be of noncombustible construction.

Basis: Absence of automatic suppression systems. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.
7. Waste containers stored in portable hazardous material storage units shall not contain flammable/combustible liquids.

Basis: Absence of automatic suppression systems. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

8. Combustible pallets shall not be used for storage of waste containers within portable hazardous material storage units.

Basis: Absence of automatic suppression systems. TFR Sections 3.3.7-1, 3.3.7-2, 3.3.7-3, and 3.3.7-4.

3.8.2 Accident Design Criteria

No accident design criteria have been identified.

3.8.3 Safety-Significant Items

Not applicable.

3.8.4 Applicable Regulatory and Contractual Requirements

Only the applicable regulatory and contractual requirements identified in Section 3.1.4 apply.

3.8.5 Applicable Industry Codes and Standards

Only the applicable industry codes and standards identified in Section 3.1.5 apply.

4. REFERENCES

- 29 CFR 1910, 2002, "Occupational Safety and Health Standards," *Code of Federal Regulations*, Office of the Federal Register.
- 29 CFR 1926, 2000, "Safety and Health Regulations for Construction," *Code of Federal Regulations*, Office of the Federal Register.
- 42 USC § 9601 et seq., 1980, "Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA/Superfund)," *United States Code*.
- DOE O 420.1, 2000, "Facility Safety," U.S. Department of Energy.
- DOE-ID, 1991, *Facility Agreement and Consent Order for the Idaho National Engineering Laboratory*, Administrative Record No. 1088-06-29-120, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; Idaho Department of Health and Welfare.
- DOE-ID, 1993, *Record of Decision: Declaration of Pit 9 at the Radioactive Waste Management Complex Subsurface Disposal Area at the Idaho National Engineering Laboratory, Idaho Falls, Idaho*, Administrative Record No. 5569, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; and Idaho Department of Health and Welfare.
- DOE-ID, 1998, *Explanation of Significant Differences for the Pit 9 Interim Action Record of Decision at the Radioactive Waste Management Complex at the Idaho National Engineering and Environmental Laboratory*, Administrative Record No. 10537, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; and Idaho Department of Health and Welfare.
- DOE-ID, 2000, "Architectural Engineering Standards," Rev. 27, U.S. Department of Energy Idaho Operations Office, Idaho Falls, Idaho, URL: <http://www.inel.gov/publicdocuments/doe/archeng-standards/default.shtml>
- DOE-ID O 420.D, July 17, 2000, "Requirements and Guidance for Safety Analysis," Rev. 0, U.S. Department of Energy Idaho Operations Office.
- DOE-STD-1027-92, 1997, "Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports," Change 1, U.S. Department of Energy, September 1997.
- DOE-STD-3009-94, 2000, "Preparation Guide for U.S. DOE Nonreactor Nuclear Facility Safety Analysis Reports," Change 1, U.S. Department of Energy, January 2000.
- FM, *Earthquake Protection for Sprinkler Systems*, Factory Mutual Data Sheet 2-8, Factory Mutual.
- Gosswiller, Eric B., 2002, *Fire Hazards Analysis for the OU 7-10 Glovebox Excavator Method*, INEEL/EXT-01-01680, Rev. 1, Idaho National Engineering and Environmental Laboratory, Bechtel BWXT Idaho, LLC, Idaho Falls, Idaho.

- Huntley, R. M. and D. E. Burns, 1995, *Scope of Work for Operable Unit 7-13/14 Waste Area Group 7 Comprehensive Remedial Investigation/Feasibility Study*, INEL-95/0253, Idaho National Engineering and Environmental Laboratory, Lockheed Martin Idaho Technologies Company, Idaho Falls, Idaho.
- ICC, 2000a, *2000 International Building Code*, ISBN 1892395266, International Code Council, Falls Church, Virginia.
- ICC, 2000b, *2000 International Fire Code*, ISBN 1892395304, International Code Council, Falls Church, Virginia.
- INEEL, 2001, *Waste Area Group 7 Analysis of OU 7-10 Stage II Modifications*, INEEL/EXT-01-01105, Rev. 0, Idaho National Engineering and Environmental Laboratory, Bechtel BWXT Idaho, LLC, Idaho Falls, Idaho.
- INEEL, 2002a, *Technical and Functional Requirements for the Operable Unit 7-10 Glovebox Excavator Method Project*, INEEL/EXT-1998-00444, TFR-2527, Rev. 3, Idaho National Engineering and Environmental Laboratory, Bechtel BWXT Idaho, LLC, Idaho Falls, Idaho.
- INEEL, 2002b, "Preliminary Documented Safety Analysis for the OU 7-10 Glovebox Excavator Method Project (Draft)," INEEL/EXT-01-01474, Rev. B, Idaho National Engineering and Environmental Laboratory, Bechtel BWXT Idaho, LLC, Idaho Falls, Idaho.
- LMITCO, 1997, *Remedial Design/Remedial Action Scope of Work and Remedial Design Work Plan: Operable Unit OU 7-10 (Pit 9 Project Interim Action)*, INEL-94/0110, Rev. 2, Idaho National Engineering and Environmental Laboratory, Lockheed Martin Idaho Technologies Company, Idaho Falls, Idaho.
- NFPA 10, 1998, "Standard for Portable Fire Extinguishers," National Fire Protection Association.
- NFPA 13, 1999, "Standard for the Installation of Automatic Sprinkler Systems," National Fire Protection Association.
- NFPA 15, 2001, "Standard for Water Spray Fixed Systems for Fire Protection," National Fire Protection Association.
- NFPA 20, 1999, "Standard for the Installation of Stationary Pumps for Fire Protection," National Fire Protection Association.
- NFPA 70, 2001, "National Electric Code," National Fire Protection Association.
- NFPA 72, 1999, "National Fire Alarm Code," National Fire Protection Association.
- NFPA 101, 2000, "Life Safety Code," National Fire Protection Association.
- NFPA 750, 2000, "Installation of Water Mist Systems," National Fire Protection Association.
- NFPA 801, 1998, "Standard for Fire Protection for Facilities Handling Radioactive Materials," National Fire Protection Association.

